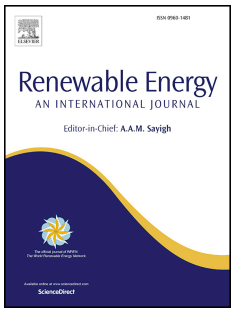
Accepted Manuscript



Utilization of by-product glycerol from bio-diesel plants as feedstock for 2,3-butanediol accumulation and biosynthesis genes response of *Klebsiella variicola* SW3

Md. Shafiqur Rahman, Chunbao (Charles) Xu, Kesen Ma, Haipeng Guo, Wensheng Qin

PII: S0960-1481(17)30708-5

DOI: 10.1016/j.renene.2017.07.080

Reference: RENE 9055

To appear in: *Renewable Energy*

Received Date: 27 January 2017

Revised Date: 16 June 2017

Accepted Date: 17 July 2017

Please cite this article as: Rahman MS, Xu C(C), Ma K, Guo H, Qin W, Utilization of by-product glycerol from bio-diesel plants as feedstock for 2,3-butanediol accumulation and biosynthesis genes response of *Klebsiella variicola* SW3, *Renewable Energy* (2017), doi: 10.1016/j.renene.2017.07.080.

Utilization of by-product glycerol from bio-diesel plants as feedstock for 2,3-butanediol accumulation and biosynthesis genes response of *Klebsiella variicola* SW3

Md. Shafiqur Rahman[a,b], Chunbao (Charles) Xu[c], Kesen Ma[d], Haipeng Guo[e], Wensheng Qin[a,*]

[a]*Department of Biology, Lakehead University, 955 Oliver Road, Thunder Bay, Ontario, P7B 5E1, Canada*

[b]*Department of Microbiology, University of Chittagong, Bangladesh*

[c]*Institute for Chemicals and Fuels from Alternative Resources (ICFAR), Western University, London, Ontario N6A 5B9, Canada*

[d]*Department of Biology, University of Waterloo, 200 University Avenue West, Waterloo, Ontario, N2L 3G1, Canada*

[e]*College of Life Sciences, Zhejiang University, China.*

*__Corresponding author__: Dr. Wensheng Qin, Email: wqin@lakeheadu.ca, Phone: +1 807-343 8467, Fax: 807-346 7796

ABSTRACT

The booming of biodiesel industry all over the world has led to generate a large amount (10% v/v) of crude glycerol, created an oversupply problem. Herein, we compared the product concentrations of major metabolic products attained from pure and crude glycerol biotransformation process using an adapted mutant strain *Klebsiella variicola* SW3. Real-time qPCR and glycerol dehydrogenase (GDH) enzyme activity assay revealed that the overexpression of GDH gene resulted in an increased GDH enzyme activity, led to a markedly boosted 2,3-butanediol (2,3-BD) production. Based on these results, the SW3 strain obtained from wild type strain *Klebsiella variicola* SRP3 displayed a 1.39-fold increased 2,3-BD production of 82.5 g/L from 59.3 g/L, yielding 0.62 g/g using pure glycerol. However, in a batch culture, a final 33.5 g/L of 2,3-BD was accumulated within 96h from 50 g/L glycerol. Moreover, the strain SW3 withstanding high concentration (200 g/L) of crude glycerol displayed 64.9 and 29.25 g/L 2,3-BD in fed-batch and batch cultures respectively. Therefore,